

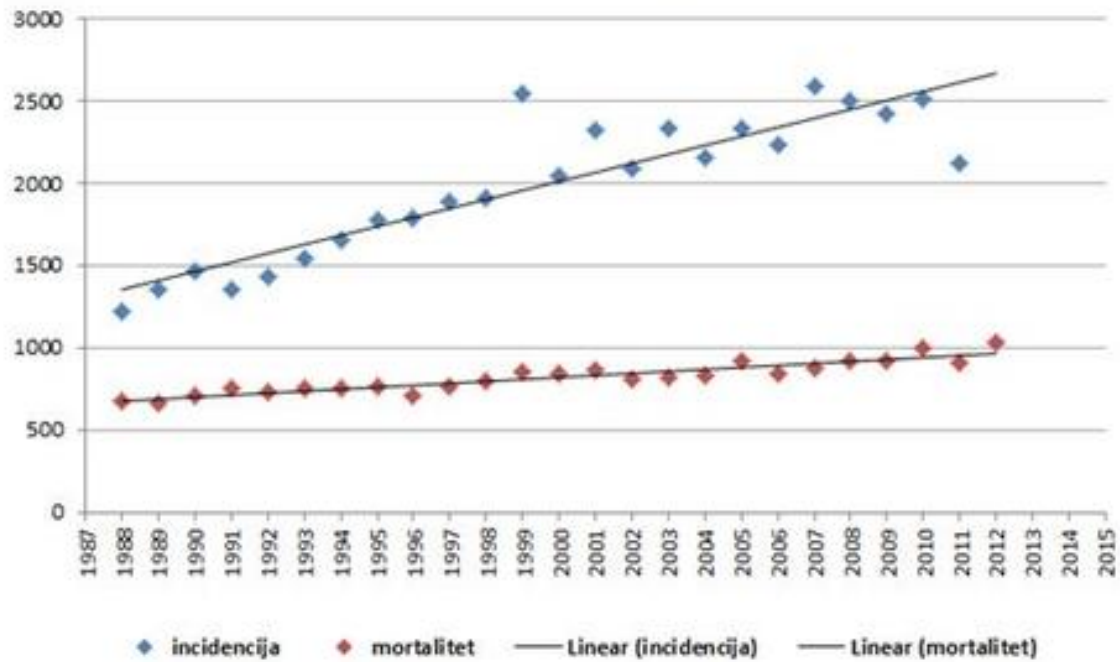
**ULTRAZVUČNA ELASTOGRAFIJA U
DIJAGNOSTIKCI
PROLIFERATIVNIH LEZIJA I
MINIMALNIH KARCINOMA DOJKE**

*Mr sc med Biljana Maksimović
Doboj, oktobar 2018.*



- Prema dostupnim podacima u svijetu svake godine od raka dojke oboli oko **1.670.000** žena, a oko **1/2 miliona** oboljelih i umre
- **20 do 30%** žena je **mlađe od 50 godina**
- u EU svaka 2,5 minuta se dijagnostikuje nova žena sa rakom dojke, a svakih 7,5 minuta umire jedna žena od ove bolesti

Rak dojke - Incidencija i mortalitet 1988-2012



- Incidenca raka dojke je 2% godišnje i svaka 8. žena ima šansu da se razboli od raka dojke u toku svog života
- Stopa smrtnosti zaostaje u odnosu na porast broja oboljelih što je u prvom redu zasluga bolje dijagnostike u ranijim stadijumima bolesti i napretka u liječenju

- 92 % žena kod kojih se karcinom dojke otkrije u ranom stadijumu vrati se na posao u prvoj godini nakon tretmana

(Pensilvania State University Study, mart 2005.)

- 96% žena preživi 5 godina kada se karcinom otkrije u ranom stadijumu

(NABCO, oktobar 2006.)

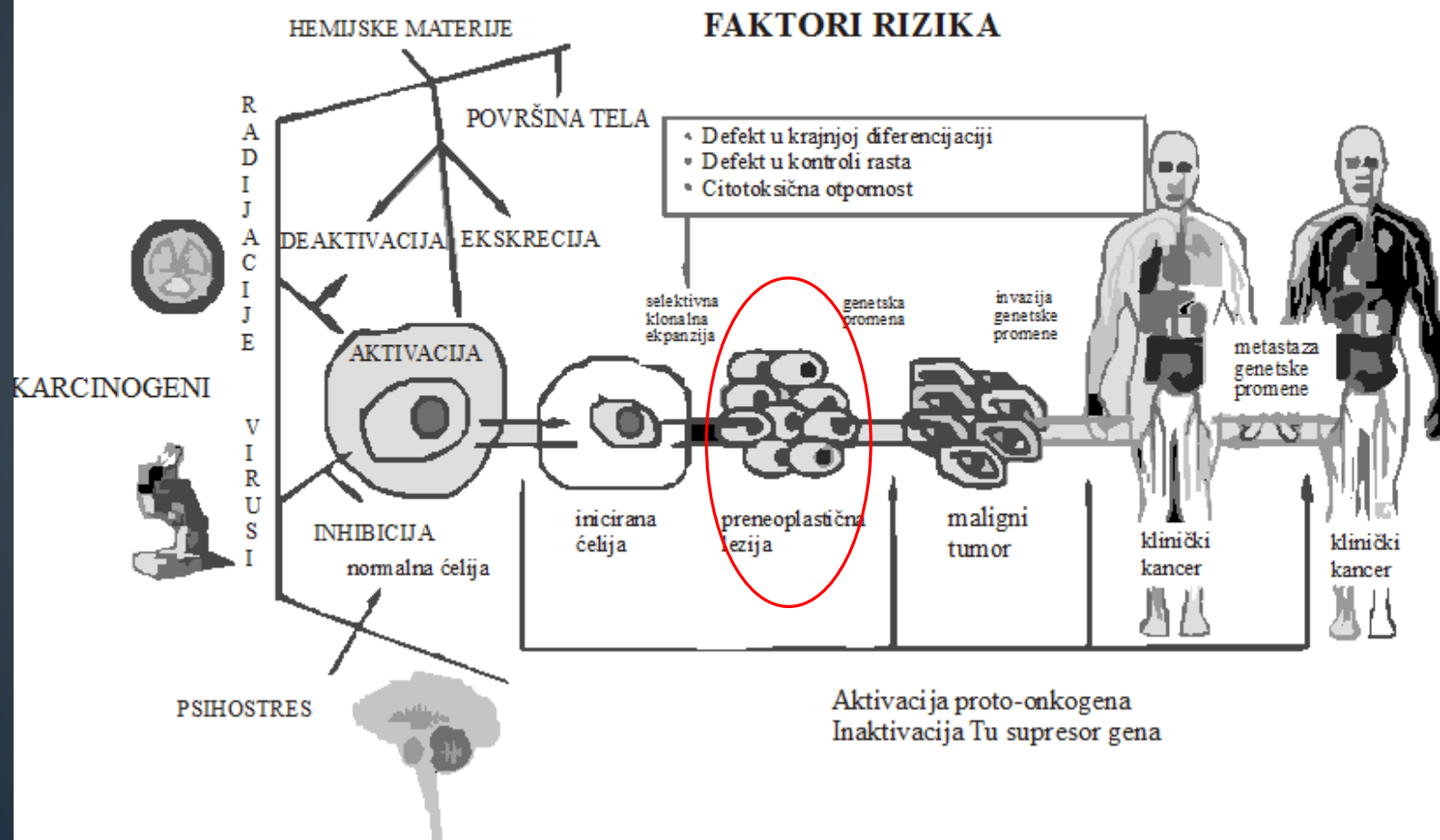
EKSPOZICIJA

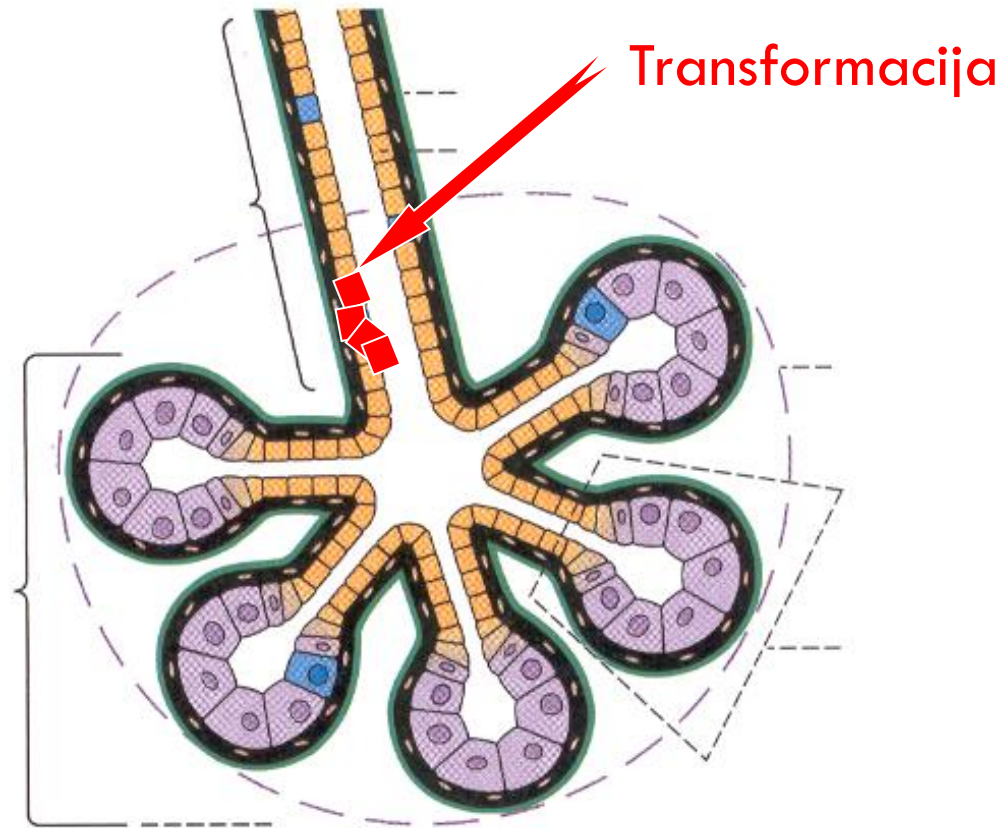
INICIJACIJA

PROMOCIJA

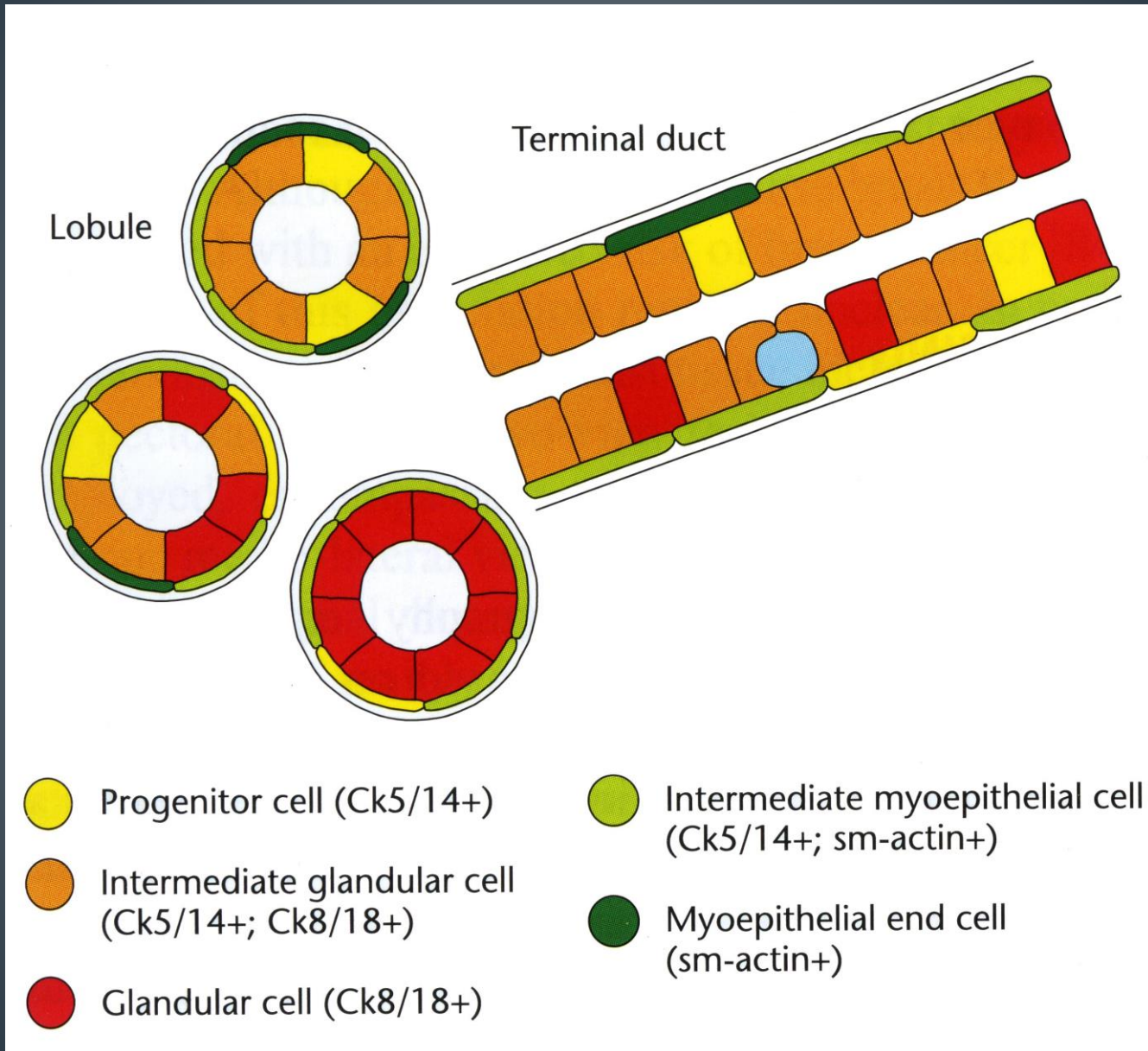
KONVERZIJA

PROGRESIJA





Architectural organization of human resting breast epithelium



KLASIFIKACIJA PROLIFERATIVNIH LEZIJA DOJKI

WHO Classification

Benign Epithelial Neoplasms

Adenosis including variants

- Sclerosing adenosis
- Nodular sclerosing adenosis
- Blunt duct adenosis
- Microglandular adenosis (MGA)
- Tubular adenosis
- Apocrine adenosis
- Adenomyoepithelial adenosis (AMA)

- Complex sclerosing lesion/ Radial scar

Adenoma of the breast

- Tubular adenoma
- Lactating adenoma
- Apocrine adenoma
- Pleomorphic adenoma
- Ductal adenoma

Precursor Lesions of Invasive Breast Cancer

Lobular Neoplasia (LCIS, ALH)

Traditional Classification

Benign Proliferative Breast Disease (BPBD)

Sclerosing adenosis (SA)

- (variant of SA)
- (variant of normal)
- (MGA lack the classical criteria of adenosis)

Radial scar/Complex sclerosing lesion

Tubular Adenoma of the breast (variants)

- (variant of adenomyoepithelioma)

Lobular Neoplasia (LCIS, ALH)

Intraductal epithelial proliferations

Usual ductal hyperplasia

(benign neoplasm, not accepted as precursor lesion, eliminated from DIN)

Ductal intraepithelial neoplasia

(DIN) Flat epithelial atypia (FEA) [DIN 1a]

Atypical ductal hyperplasia (ADH) [DIN 1b]

Ductal carcinoma in situ, grade 1 [DIN 1c]

Ductal carcinoma in situ, grade 2 [DIN 2]

Ductal carcinoma in situ, grade 3 [DIN 3]

Usual ductal hyperplasia

Flat epithelial atypia (FEA)

Atypical ductal hyperplasia (ADH)

Ductal carcinoma in situ

Ductal carcinoma in situ, grade 1

Ductal carcinoma in situ, grade 2

Ductal carcinoma in situ, grade 3

Intraductal papillary neoplasms

Benign intraductal papilloma

(benign epithelial neoplasm with papillary growth pattern)

Papillary carcinoma, noninvasive

Encysted papillary carcinoma

Papillary tumours

Papillary adenoma (papilloma)

DCIS, papillary

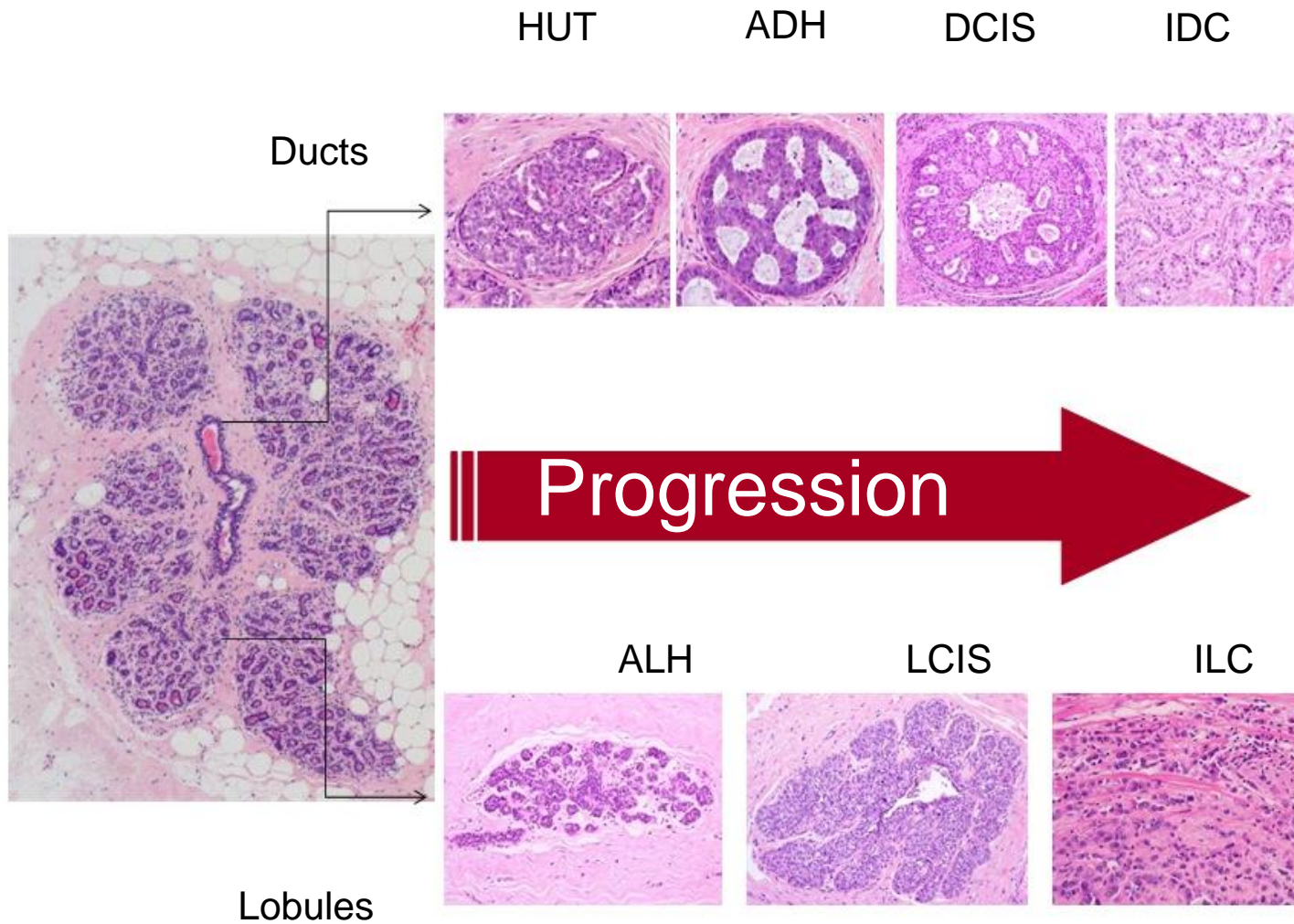
Encysted papillary carcinoma

Intraduktalne proliferativne lezije

DIN - Terminologija

tradicionalno	DIN- Terminology	aktuelno
UDH	UDH	Low risk DIN
Flat atypia	DIN 1a	DIN-1 flat type
ADH	DIN 1b	DIN 1 < 2mm
DCIS grade 1	DIN 1c	DIN 1 > 2mm
DCIS grade 2	DIN 2	DIN 2
DCIS grade 3	DIN 3	DIN 3

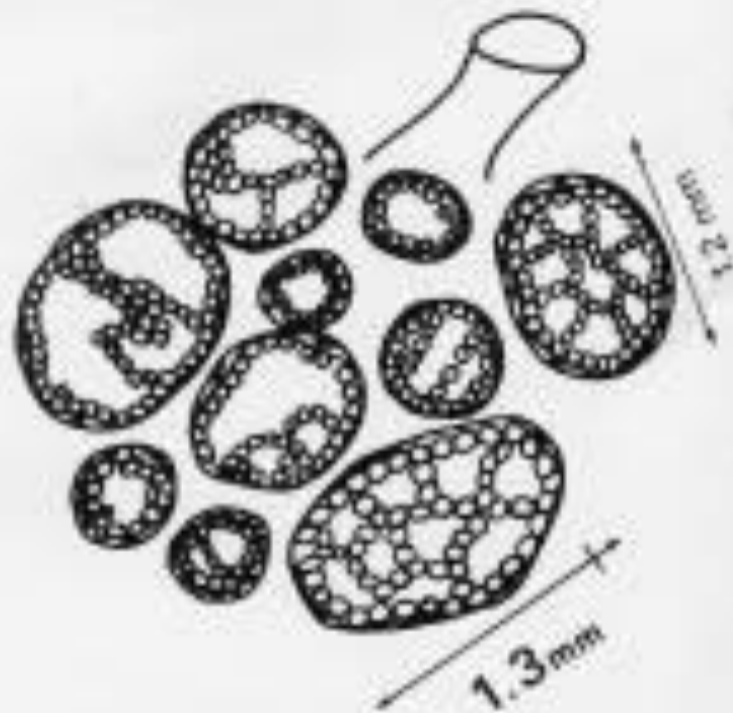
Historical perspective of breast cancer evolution





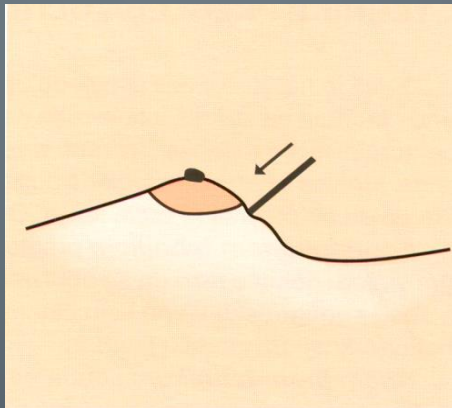
1.8 mm

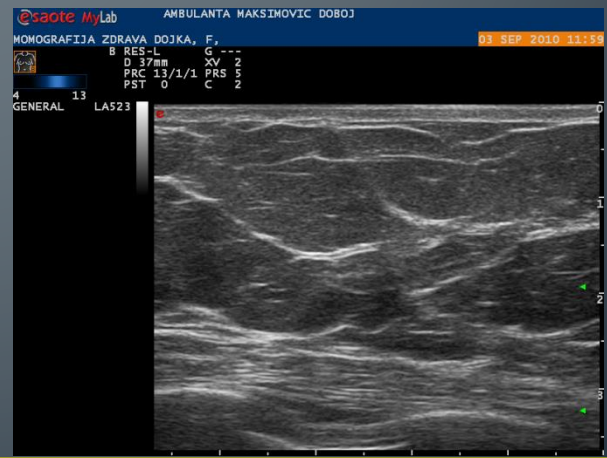
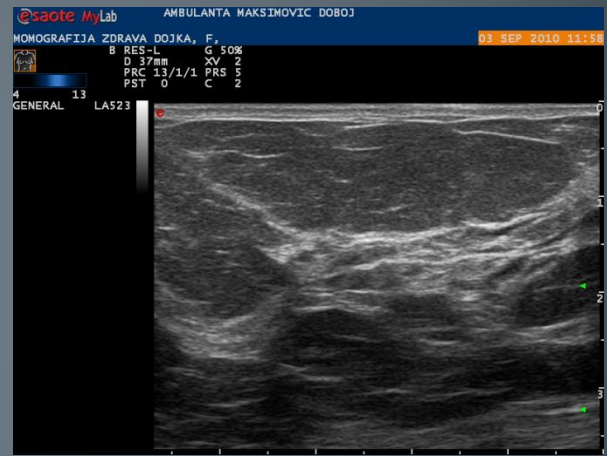
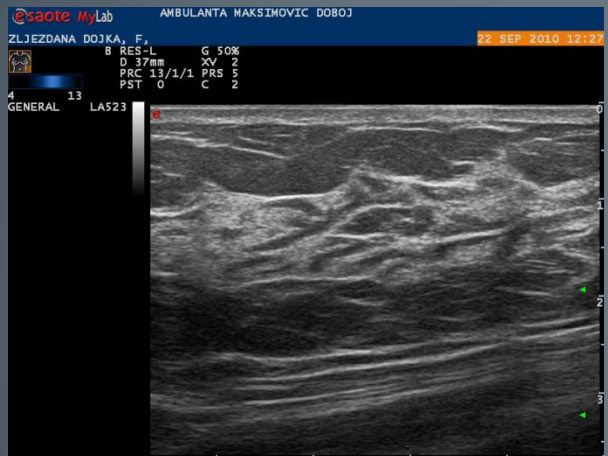
AIDH



Aggregate 2.5

DCIS

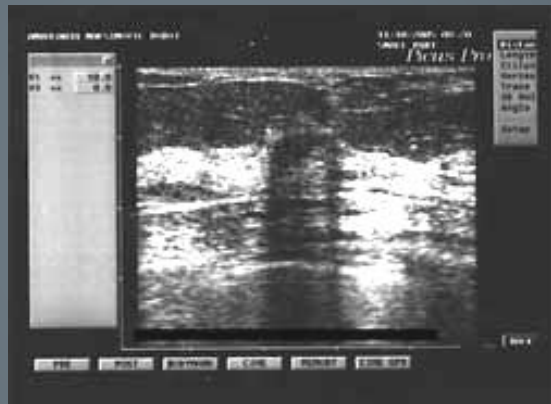




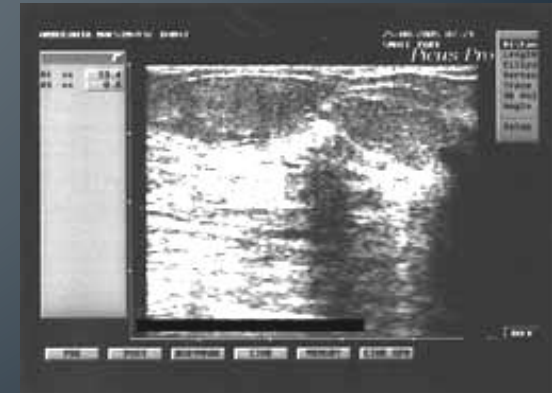
ADH



DCIS



Mastopathia fibrosa



Hipokrat je prvi među naučnicima uočio razliku među tkivima koja se pritišću.

Elasticity

Changes in tissue elasticity are related to pathological changes

... Such swellings as are *soft*, free from pain, and *yield to the finger*, ... and are *less dangerous* than the others.

... then, as are painful, *hard*, and large, indicate *danger of speedy death*; but such as are *soft*, free of pain, and *yield when pressed with the finger*, are more *chronic* than these.

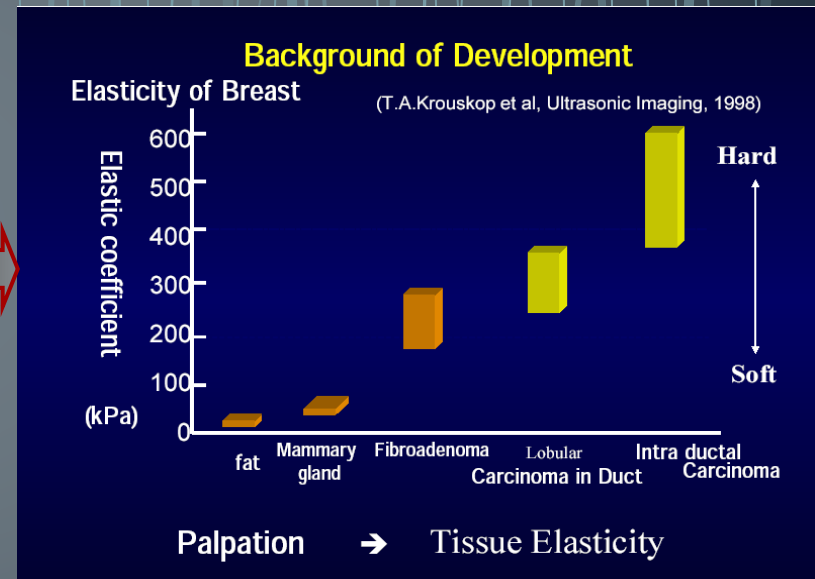
THE BOOK OF PROGNOSTICS, Hippocrates, 400 B.C.

It is the business of the physician to know, in the first place, things similar and things dissimilar; ... which are to be seen, touched, and heard; which are to be perceived in the sight, and the touch, and the hearing, ... which are to be known by all the means we know other things.

ON THE SURGERY, Hippocrates, 400 B.C.



Hippocrates



- U toku ultrazvučnog pregleda pritiskom sondom mekotkivnih struktura mekane strukture se nakon spoljnjeg pritiska deformišu a tvrde ostaju nepromijenjene.
- To je okrenulo interesovanje naučne i stručne javnosti ka procjeni mehaničkih odnosno elastičnih svojstava tkiva kojima se može definisati postojanje patološkog supstrata, odnosno patološka izmijenjenost tkiva i organa.

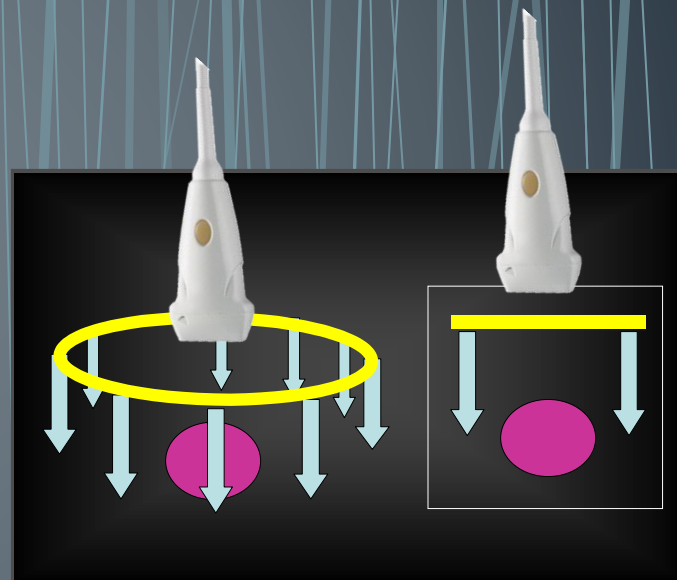
- Krajem 20.vijeka elasografija je prvi puta uvedena u kliničku praksu
- Prvi rezultati u Evropi su prikazani na Evropskom kongresu radiologa 2006.
- ACR-BIRADS peto izdanje 2013. je uvrstio elastografiju kategorizaciju promjena u dojkama
- Vodiči za kliničku upotrebu su definisani
 - EFSUMB (European Federation of Societies for Ultrasound in Medicine and Biology)
 - WFUMB (World Federation for Ultrasound in Medicine and Biology).

Dvije metode ultrazvučne elastografije kojima se testiraju elastografske karakteristike :

- Kvazi statički metod (**Strain**) – kome se širenje elastičnosti ciljanog tkiva dobija posmatranjem odnosa kompresije i otpora u tkivu.
- Dinamički metod (**Shear wave**) – dobijanje elastičnosti ciljanog tkiva kroz brzine pomijeranja talasa koji se stvaraju u tkivu.

PRIMJENA SONDE KOD ELASTOGRAFIJE

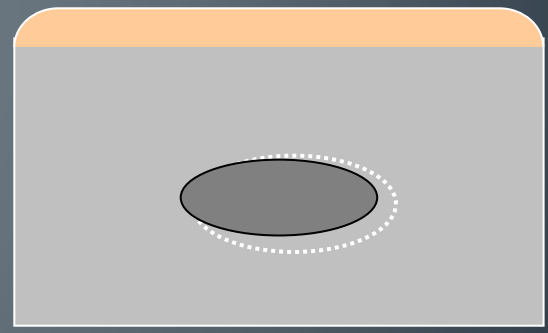
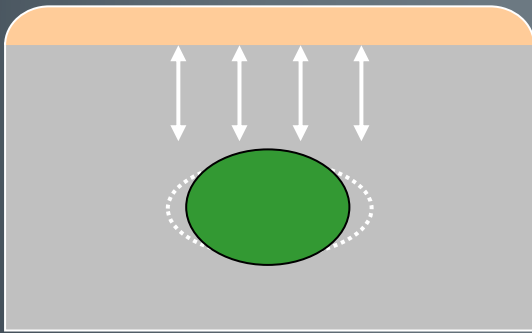
- RITMIČNO
- LAGANO
- KONSTANTNO
- MONODIREKTNO (na istom mjestu bez klizanja)
- ADHERENTNO (na koži ne odvajajući je od nje)



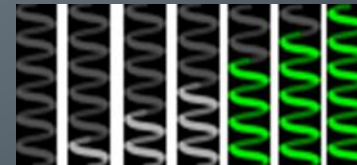
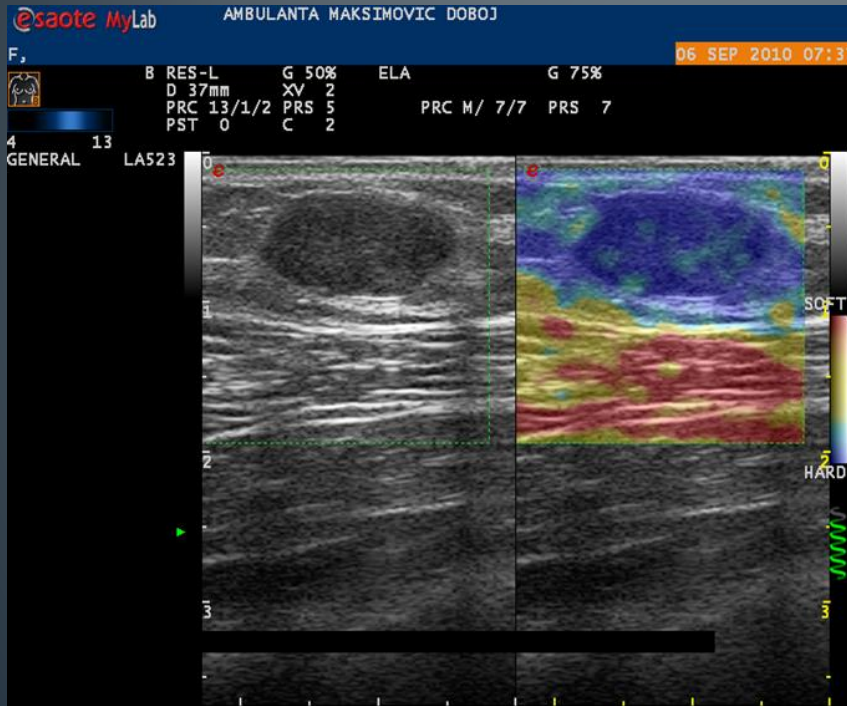
DA



NE

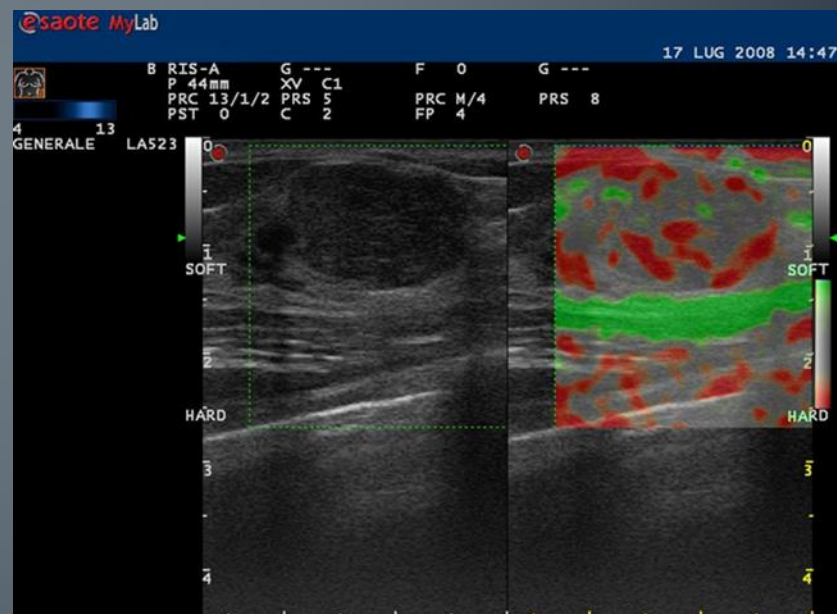
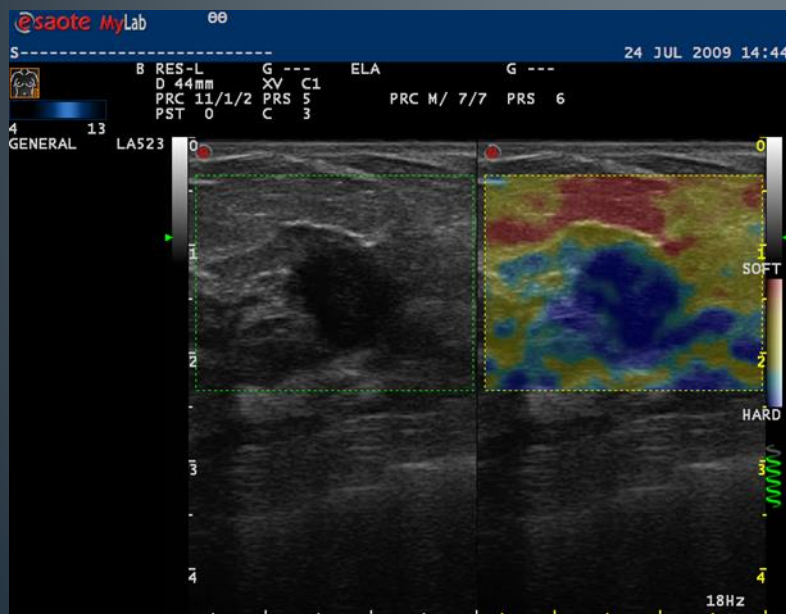


Pravilno izvedenu pretragu pokazuje green spring i tek kada je zavojnica u zelenoj boji pregled je obavljen na pravilan način



Dual view omogućava real-time poređenje dvije slike sa modalitetima za pravilnu interpretaciju.


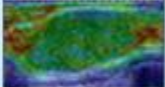

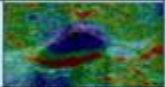

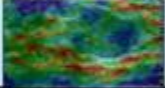

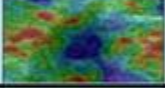

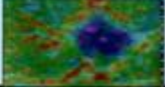


Program elastografije ima više prozora različitog spektra boja za prikaz ispitivanog dijela tkiva.



Meke strukture su benigne a tvrdu strukturu imaju proliferativne i maligne lezije.

Na osnovu tih osobina data je kategorizacija promjena o dojčkama u vidu scora 1 do 5

Tsukuba Elasticity Score Patterns
Itoh A, Ueno E, Tohno E et al. Breast Disease: Clinical Application of US Elastography for Diagnosis. Radiology 2006; 239:341 - 350

Score	Classification Standard		Typical Image
1	Strain is seen in the entire hypoechoic area (the entire lesion is shown in green similar to the surrounding tissue)		
1*	BGR (blue-green-red) 3 layer pattern – typical artefact seen in a cystic lesion		
2	Strain is seen within most of the hypoechoic area but some areas show no strain (the lesion is a mixture of green and blue)		
3	Strain appears only in the periphery with no strain in the centre of the lesion (the centre of the lesion is shown as blue with the periphery in green)		
4	No strain is measured within the lesion (the entire lesion is shown in blue)		
5	No strain is measured within the lesion nor in the surrounding tissues (the lesion and the surrounding tissues are blue)		

Osim kvalitativnog kolor prikaza promjene se mogu mjeriti te se time dodatno kvantifikovati.

Mjeri se:

- MEAN - tvrdoća promjene
- SD - homogenost
- SR - indeksi otpora

MEAN:

- 1-16 su maligne lezija
- 17-30 su proliferativne lezije
- 31-50 benigne lezije
- 50-100 meke i tečne benigne lezije

INDEKS OTPORA-u tkivima i u promjeni:

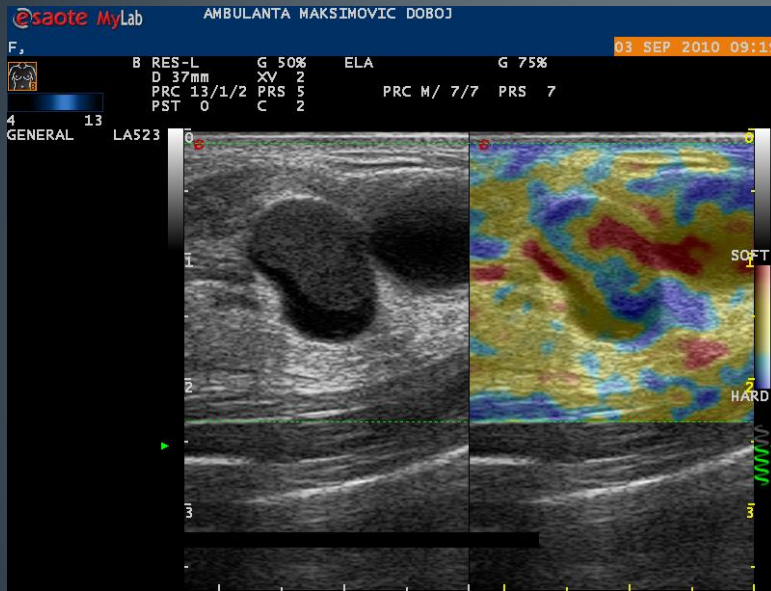
- 1 – uredan nalaz
- 2 - 3 – benigne lezije
- veće od 3 – proliferativne lezije
- veće od 5 – maligne lezije

Ultrazvučna elastografija je metoda kojom se mogu dijagnostički procijeniti lezije:

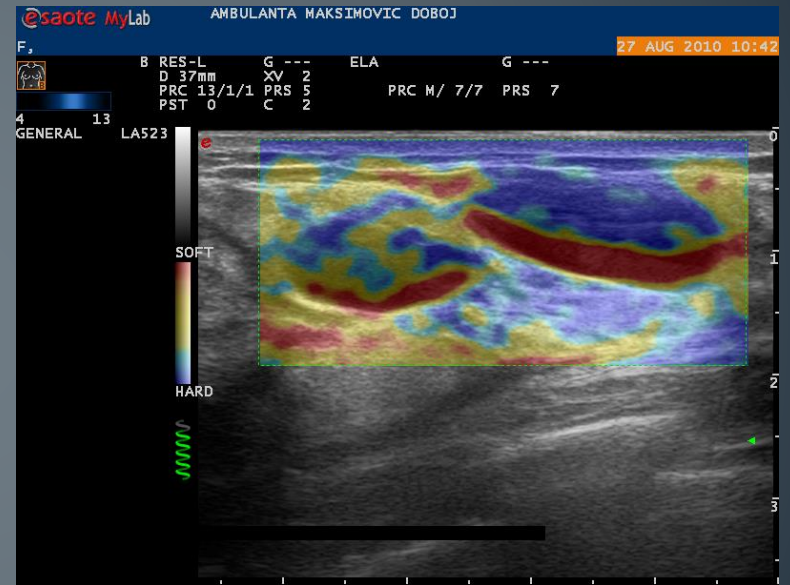
- **BENIGNE**
- **PROLIFERATIVNE**
- **MALIGNE**

Ona se primjenjuje u sklopu ehografije zajedno sa doplerom radi tačnijeg definisanja karaktera lezije.

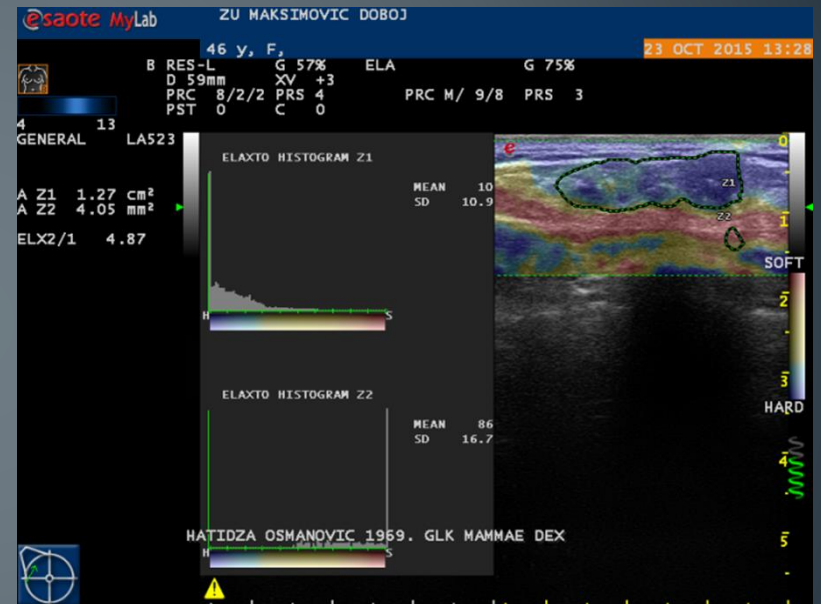
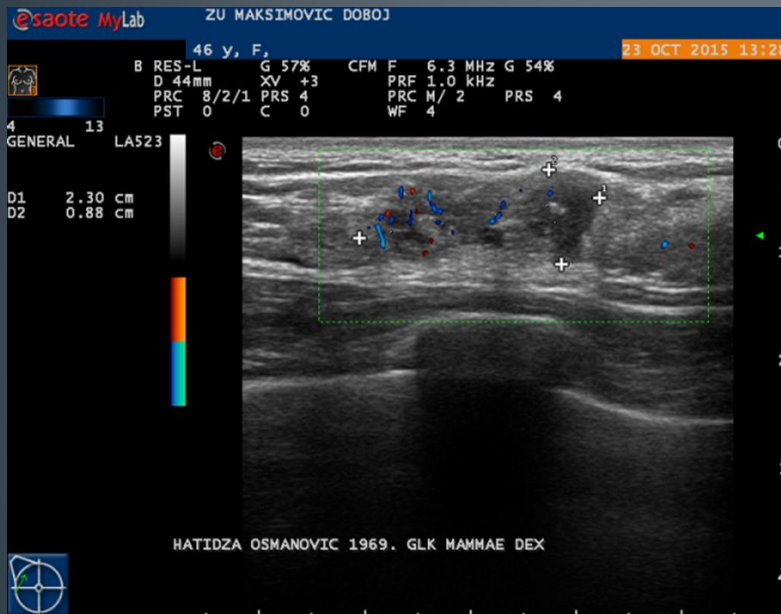
Cystis oleis
Masthitis chr



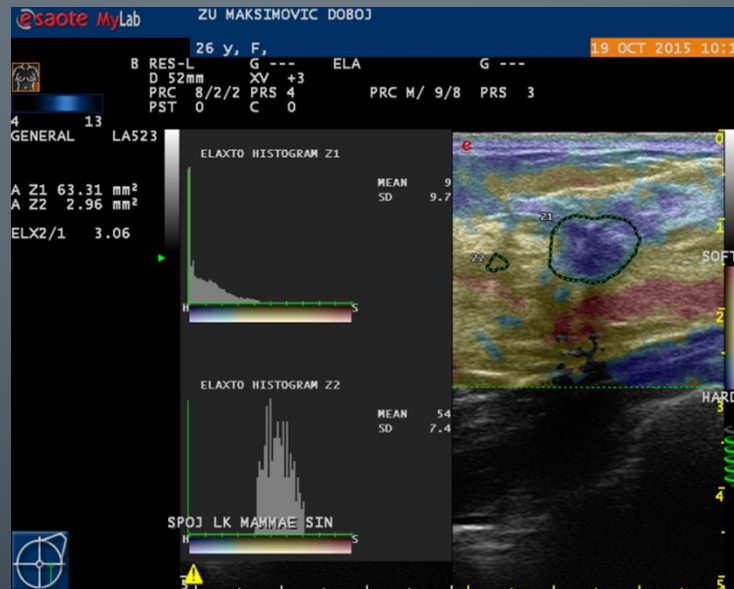
Dysplasia cystica.



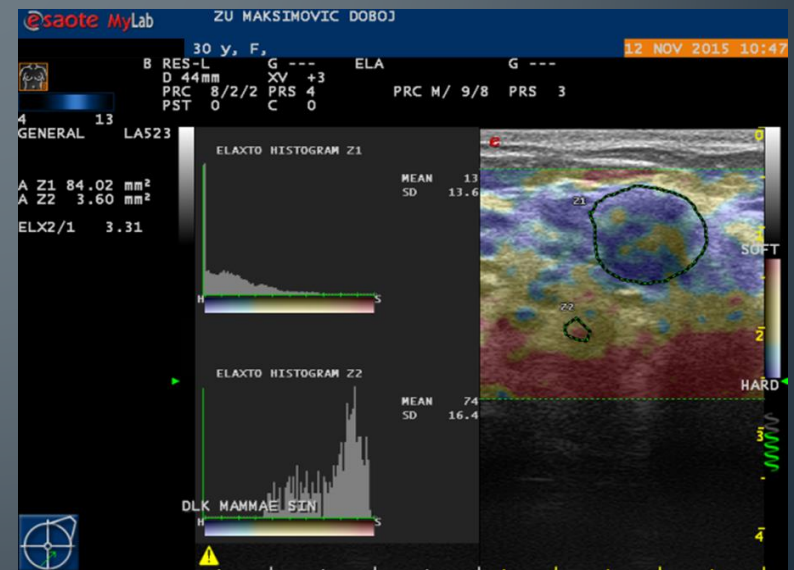
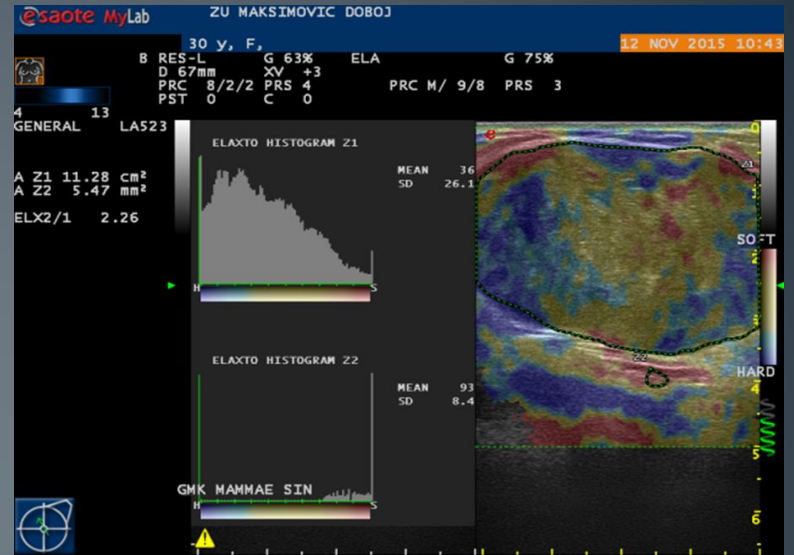
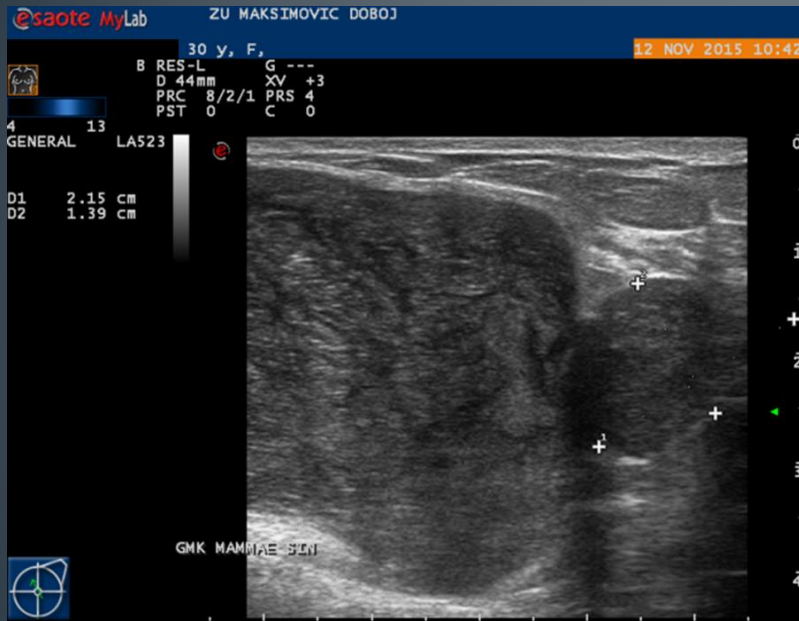
ADH



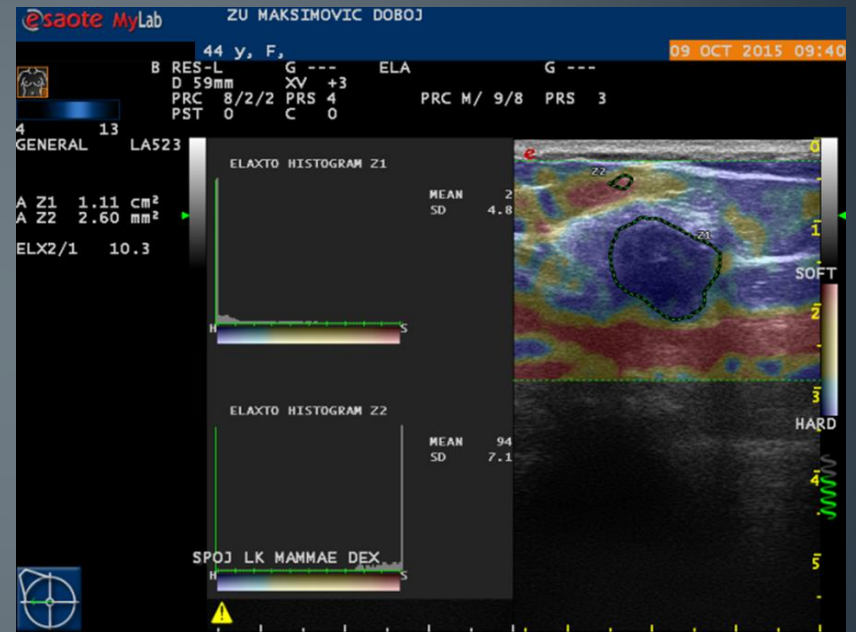
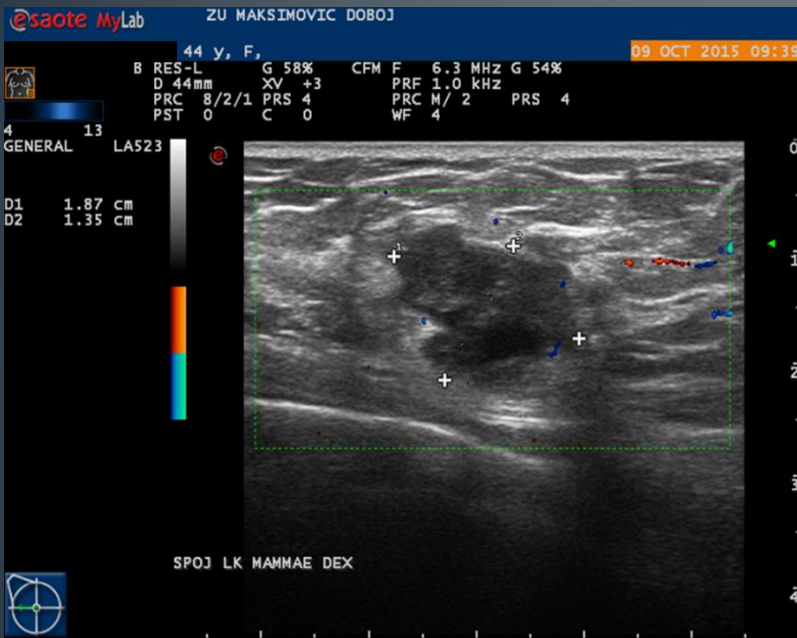
Adenosis sclerotisans, UDH, Flat atypia

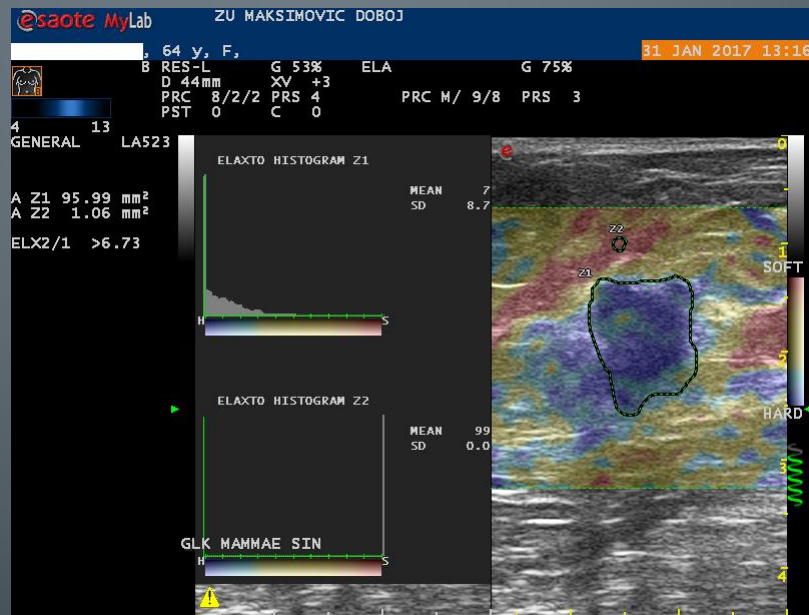
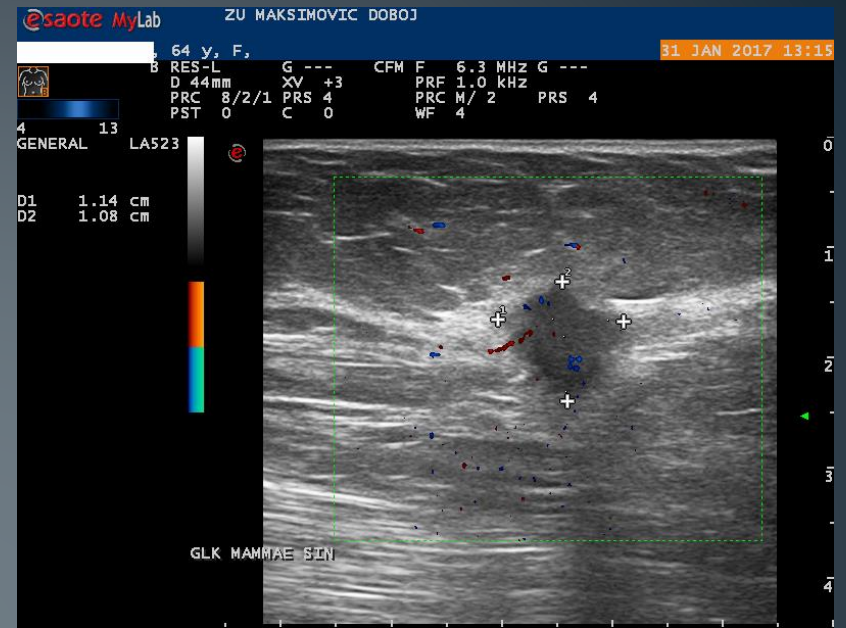


FA, CDI

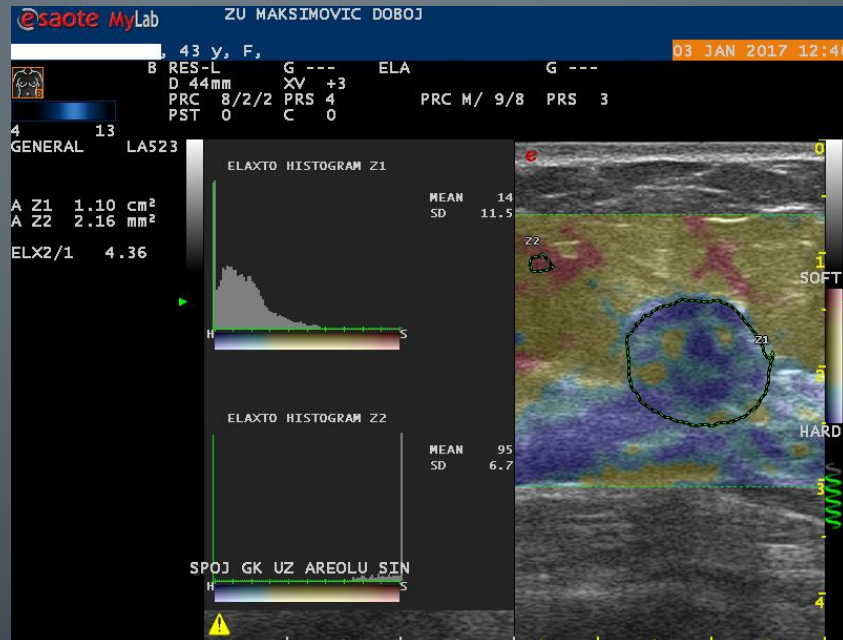
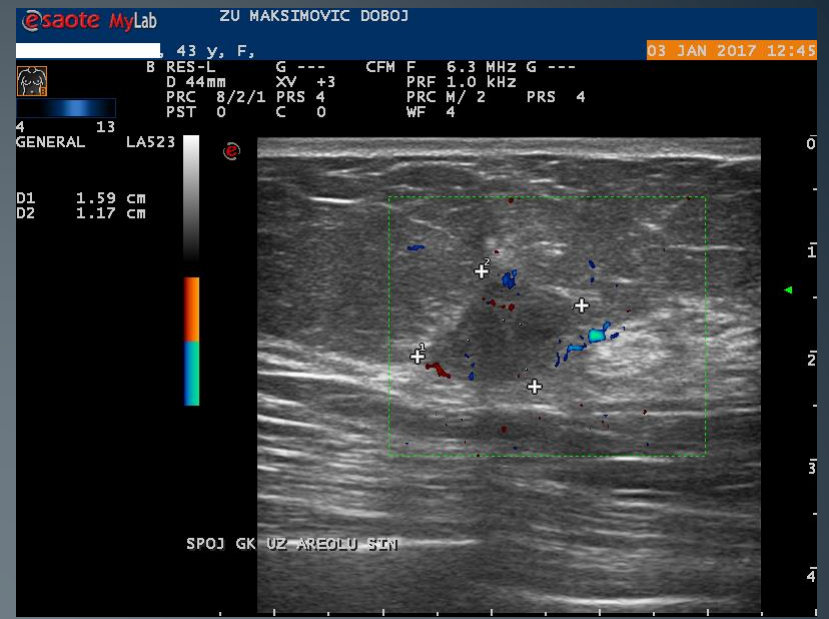


Ca ductale invasivum

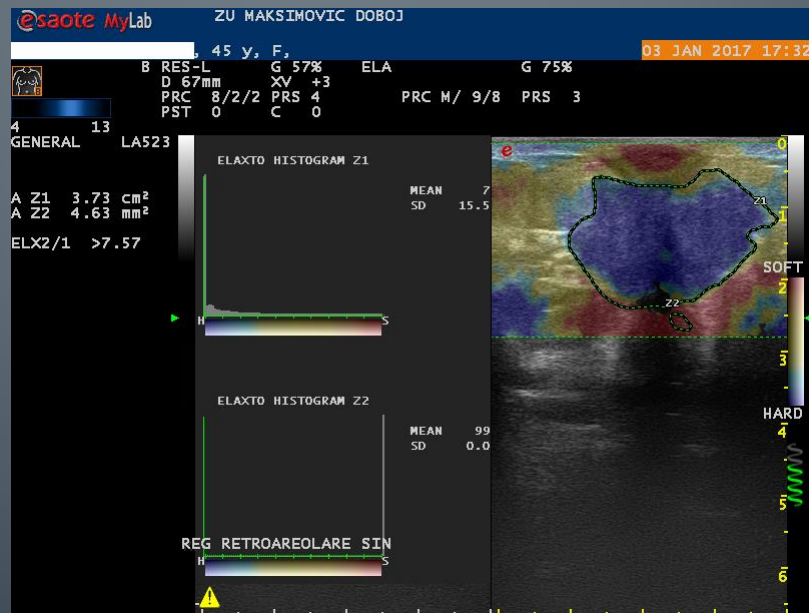
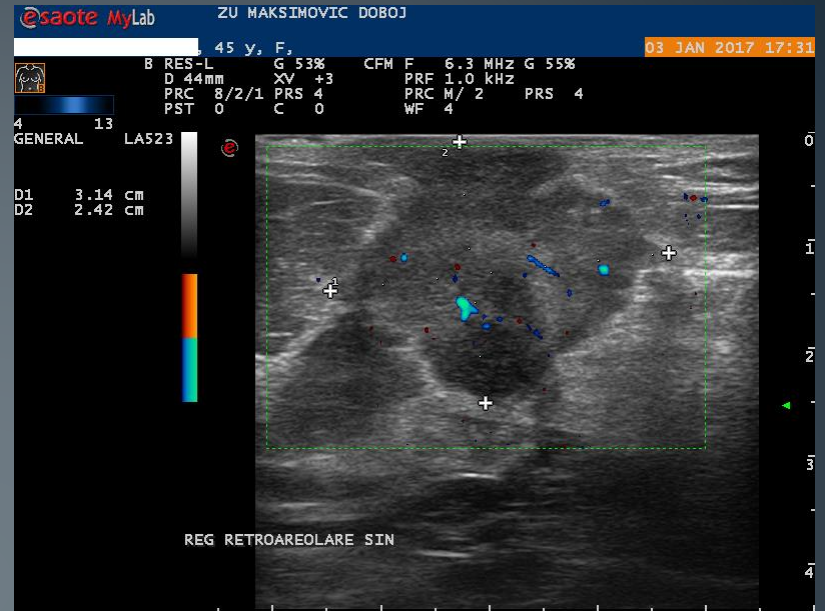
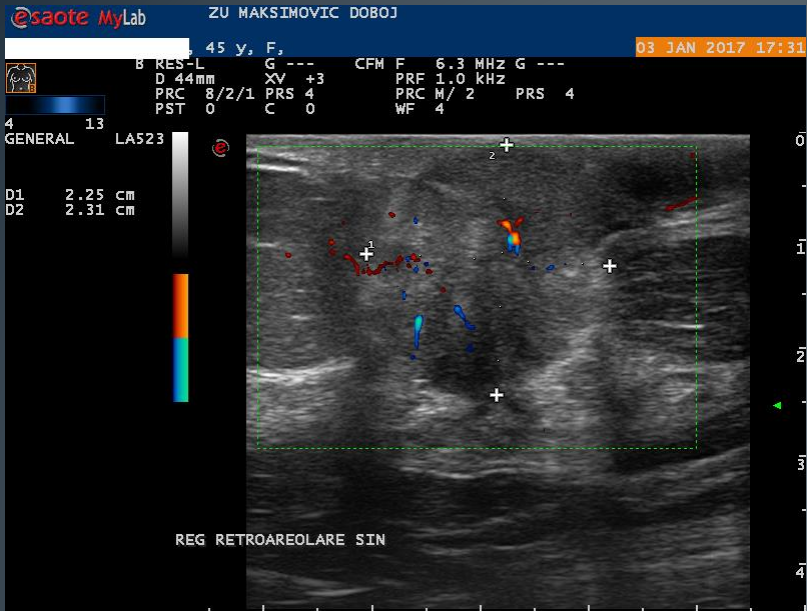




Ca ductale invasivum

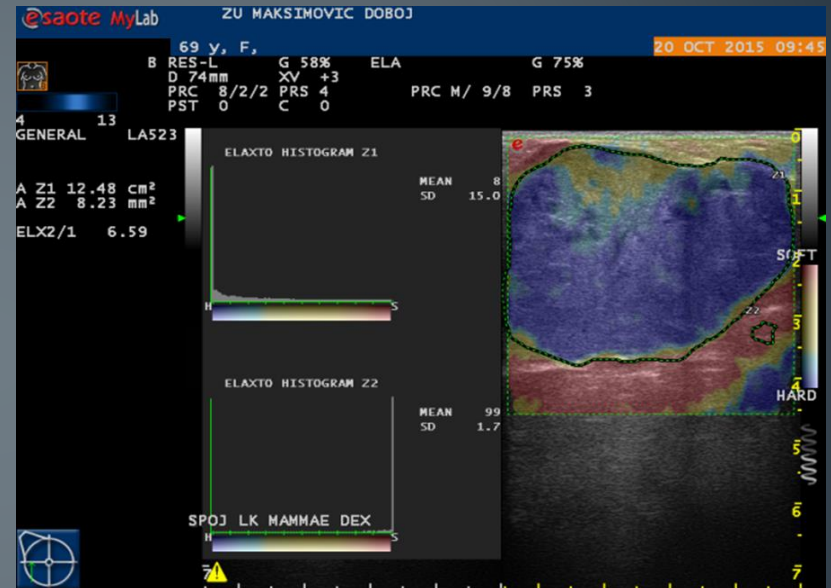
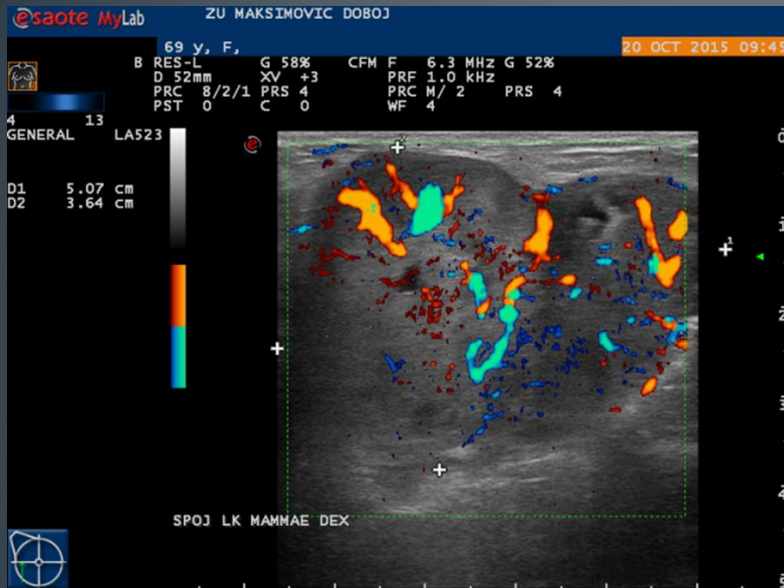


Ca ductale invasivum

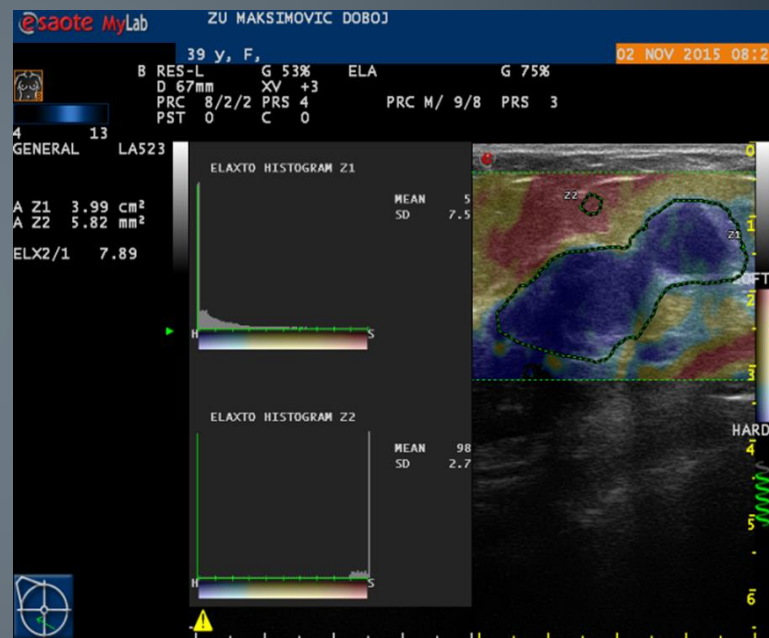


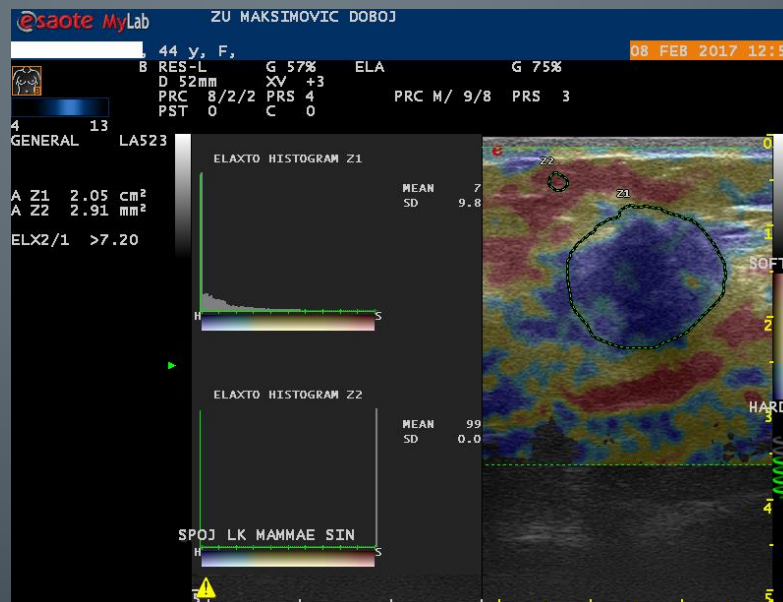
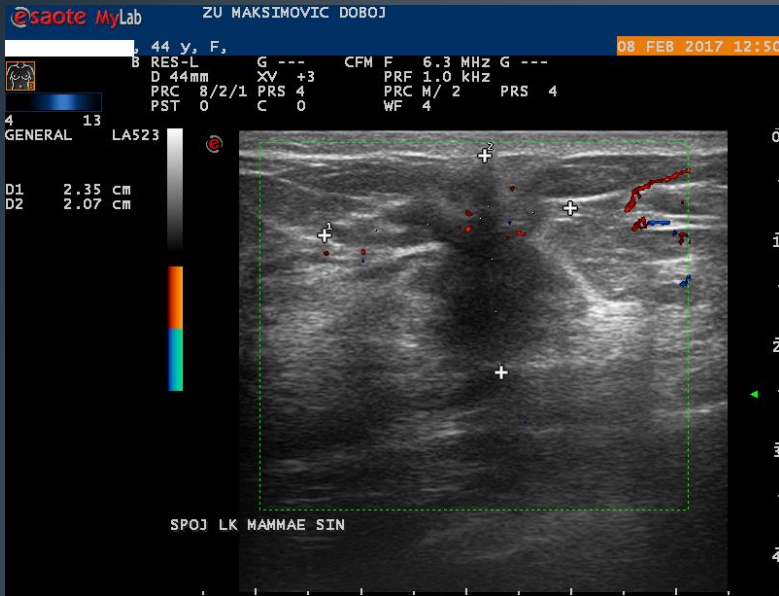
Ca ductale invasivum

Ca ductale invasivum

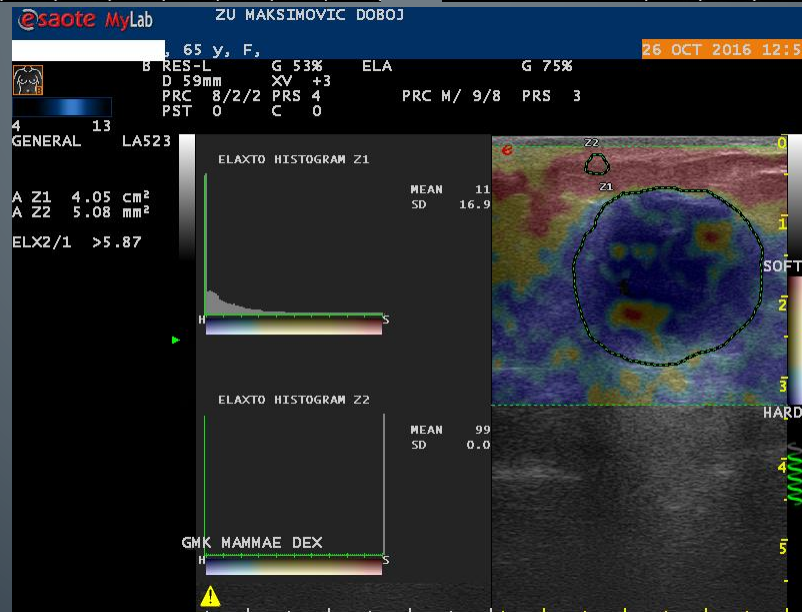
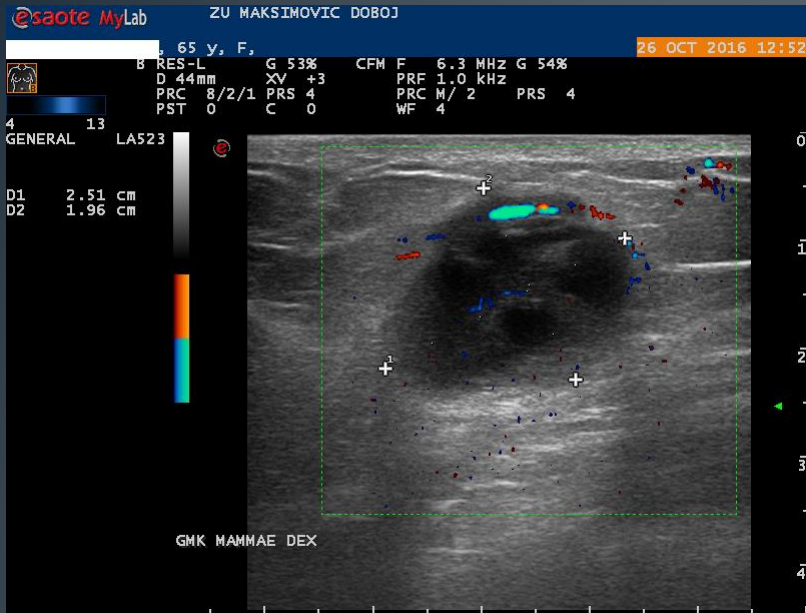


Ca ductale invasivum



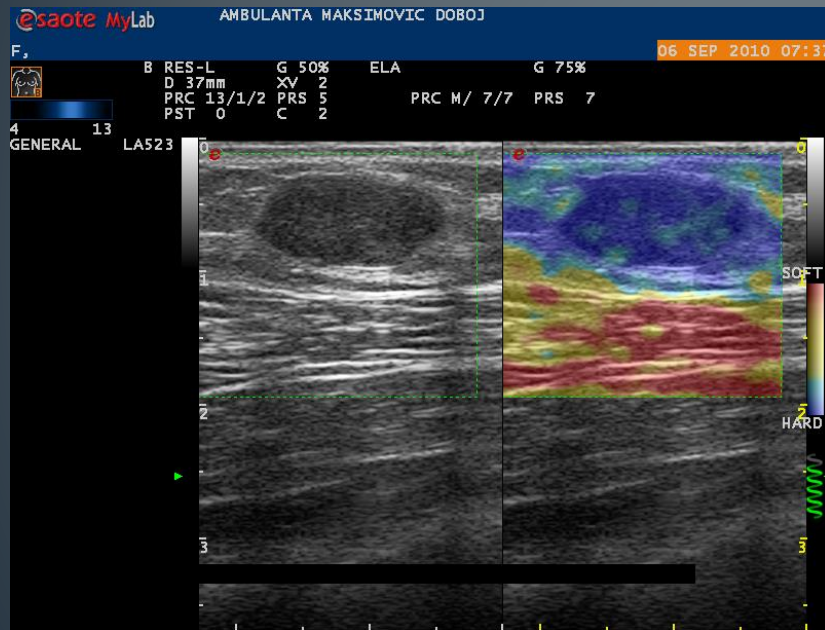


Ca ductale invasivum

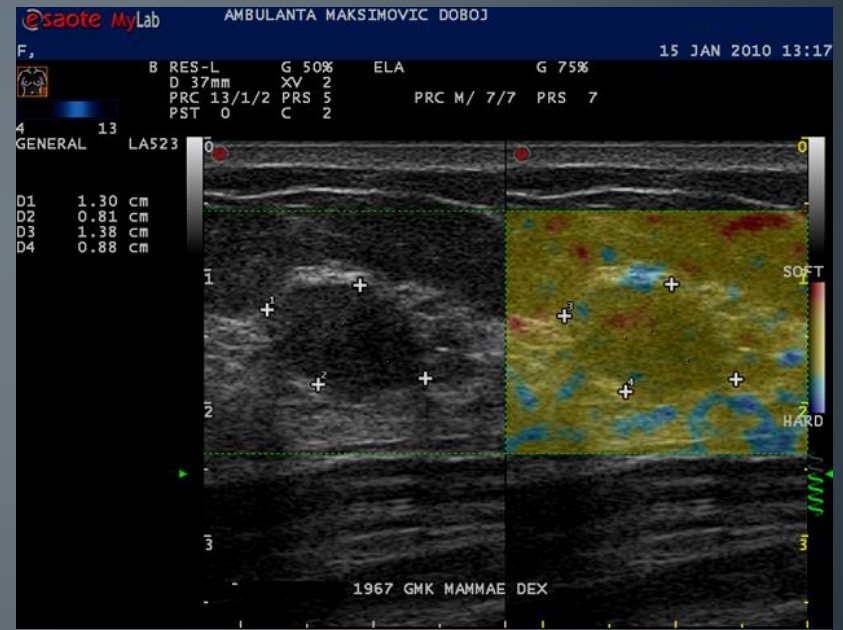


Ca ductale invasivum

Ca ductale invasivum



Fibroadenoma



autor	broj lezija	Senzitivnost %	Specifičnost %
Ako Itoh i sar. RSNA 2006.	111	86,5	89,8
W.Svensson DiagnosticImaging 2006.	345	80	93
Giorgio Rizzatto MEDIX suppl. 2007.	847	98	93
Alice McCarty ARRS 2009.	110	88,5	81
Stamantia V.Destounis i sar RSNA 2009.	200	98	78
Jung Hyun Yoon RSNA 2010.	233	76,5	96,9
Todd R.Kumm PubMed 2010.	310	79	81
Biljana Maksimović Ekologija,zdravlje,rad i sport 2011.	200	88	82
Lucas Ebner Radiology 2014.	110	90,3	78,5
JianQiao Zhou Radiology 2014.	193	98,6	98,5
Yi Hao Scientific Reports,2016.	300	88,6	86,1
Timothy Musila Mutala Cancer Imaging 2016	118	86	96%

ITALIJANSKI EKSPERTI SU DEFINISALI SMJERNICE ZA PRIMJENU ELASTOGRAFIJE U ULTRAZVUČNOJ DIJAGNOSTICI PROMJENA U DOJKAMA

(European Society of Radiology 2008)

- Elastografija može povećati specifičnost ultrazvuka u evaluaciji fokalnih lezija u dojci.
- Nije primjenjiva za hiruške ožiljke, difuzne lezije ili lezije veće od polja pregleda sondom
- Interpretacija elastografije zahtjeva globalno iskustvo u imagingu dojke sa evaluacijom svih dostupnih slika.
- Prisutna je i kriva učenja: trening mora uključivati skeniranje i interpretaciju najmanje 30 slučajeva pod supervizijom eksperta.

- Za svaku leziju se moraju akvizirati najmanje dvije tačne elastografije od po 5 sekundi.
- Lezija mora biti u centru polja koje se skenira i elastografija mora pokrivati gotovo cijelo polje pregleda.
- Za lezije mješovite strukture u B-modu, moraju se snimiti dvije elastografije kroz vertikalni plan skeniranja.
- Ostvareni pritisak sonde mora biti konstantan i vertikalan i na prednjoj granici lezije i na torakalnom dijelu. Lateralni pokreti se moraju izbjeći jer oni inače proizvode artefakte

Najvažnija uloga elastografije u dijagnostikovanju promjena u dojkama je:

- dopunska karakterizacija nejasnih nalaza pod BI RADS 3 i 4a
- identifikacija cista: razlikovanje komplikovanih cista od solidnih nodusa
- razlikovanje solidnih lezija od “masnih komora”

Elastografija omogućava dopunsku karakterizaciju i odluku o biopsijama:

- tvrda lezija BI RADS 3 → BI RADS 4a (biopsija)
- meka lezija BI RADS 4a → BI RADS 3
(nije potrebna biopsija)
- praćenje posle FNA (lažno negativna?)

Ultrazvučna elastografija je dobar alat u dijagnostici promjena u dojkama:

- komplementarna metoda za karakterizaciju lezije u svakodnevnoj praksi
- procena tumorske ekstenzije bolja nego u B modu
- brza, neinvazivna, dobro prihvaćena od pacijenata
- uloga u klasifikaciji BI RADS 3 i 4a (skraćuje čekanje na biopsije i smanjuje nepotrebne biopsije)
- potvrda suspektnih promjena BI-RADS 5

Literatura

- Itoh A, Ueno E, Tohno E, et al. Breast disease: clinical application of US elastography for diagnosis. *Radiology*. 2006;239:341–50.
- Sadigh G, Carlos RC, Neal CH, Dwamena BA. Ultrasonographic differentiation of malignant from benign breast lesions: a meta-analytic comparison of elasticity and BIRADS scoring. *Breast Cancer Res Treat*
- Gong X, Xu Q, Xu Z, Xiong P, Yan W, Chen Y. Real-time elastography for the differentiation of benign and malignant breast lesions: a meta-analysis. *Breast Cancer Res Treat*. 2011;130:11–8.
- Scaperrotta G, Ferranti C, Costa C, et al. Role of sonoelastography in non-palpable breast lesions. *Eur Radiol*. 2008;18:2381–9.
- Cho N, Moon WK, Chang JM, et al. Sonoelastographic lesion stiffness: preoperative predictor of the presence of an invasive focus in nonpalpable DCIS diagnosed at US-guided needle biopsy. *Eur Radiol*. 2011;21:1618–27.
- Cho N, Moon WK, Chang JM, et al. Sonoelastographic lesion stiffness: preoperative predictor of the presence of an invasive focus in nonpalpable DCIS diagnosed at US-guided needle biopsy. *Eur Radiol*. 2011;21:1618–27.
- Chang JM, Moon WK, Cho N, Kim SJ. Breast mass evaluation: factors influencing the quality of US elastography. *Radiology*. 2011;259:59–64.
- J.F.Carlsen,M.R.Pedersen,C.Ewertsen,A.Saftoiu,L.Lonn,S.R.Rafaelsen,M.B.Nielsen, Original Research. A Comparative Study of Strain and Shear_Wave Elastography in an Elasticity Phantom,American Journal of Roentgenology. 2015;204:W236-W242. 10.2214/AJR.14.13076
- Sadigh G, Carlos RC, Neal CH, Dwamena BA. Ultrasonographic differentiation of malignant from benign breast lesions: a meta-analytic comparison of elasticity and BIRADS scoring. *Breast Cancer Res Treat* 2012; 133:23–35
- Yoon JH, Kim MH, Kim EK, Moon HJ, Kwak JY, Kim MJ. Interobserver variability of ultrasound elastography: how it affects the diagnosis of breast lesions. *AJR* 2011; 196:730–736
- Cho N, Moon WK, Park JS, Cha JH, Jang M, Seong MH. Nonpalpable breast masses: evaluation by US elastography. *Korean J Radiol* 2008; 9:111–118
- Cho N, Moon WK, Kim HY, Chang JM, Park SH, Lyoo CY. Sonoelastographic strain index for differentiation of benign and malignant nonpalpable breast masses. *J Ultrasound Med* 2010

Hvala na pažnji



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